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REMARKS

Claims 1-3, 11-16 and 20-25, as amended are pending in this application for the Examiner's review and consideration. Claims 4-9 and 17-19 were canceled without prejudice. Applicant reserves the right to file one or more divisional or continuation applications directed to this or other unclaimed subject matter. Applicant's appreciate the Examiner's recognition of patentable subject matter in claims 10-13. Claim 10 was canceled and claim 1 was amended to include the features of canceled claim 10. Claim 2 was amended to properly recite "the high-index multilayer" as recited in independent claim 1. Claims 11 and 12 were amended to depend from claim 1 rather than canceled claim 10. Claim 14 was amended to more clearly recite that the "low index thin layers have a refractive index between 1.30 and 1.65." Claim 20 was amended to properly recite the "transparent substrate of claim 1." Claim 25 was amended to delete the word "adapted." No new matter has been added by these claim amendments so that their entry at this time is warranted.

THE REJECTION UNDER 35, U.S.C., § 112, SECOND PARAGRAPH

Claims 20-25 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for the reasons set forth on page 2 of the Office Action. The Examiner alleges that claim 25 is unclear since it recites an "antireflection coating" but depends from claim 1 that recites a "transparent substrate." Applicants have amended claim 20 to properly recite a "transparent substrate."

The Examiner also alleged that the term "adapting" in claim 25 renders the claim indefinite. Applicants have amended claim 25 to delete the word "adapted." For the above reasons, Applicants respectfully request that the rejections under 35 U.S.C. § 112, second paragraph, be reconsidered and withdrawn.

THE REJECTION UNDER 35, U.S.C. § 102 (B)

Claims 1-3 and 14 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,940,636 to Brock ("Brock") and by Japanese Patent Publication No. 59-184744 to Nakano ("Nakano") for the reasons set forth on pages 2-3 of the Office Action.

Brock discloses an optical interference filter having an alternative sequence of first low-refractive index layers and second high-refractive index layers on a glass substrate

(*See, e.g.*, Brock, column 2, lines 40-44). The first layer consists substantially of amorphous SiO_2 and the second layer consists of TiO_2 and a second metal oxide (*See, e.g.*, Brock, column 2, lines 44-46). The second layer is a mixed oxide of TiO_2 and ZrO_2 or TiO_2 and HfO_2 , $\text{TiO}_2\cdot\text{ZrO}_2$, $\text{TiO}_2\cdot\text{HfO}_2$, $\text{TiO}_2\cdot\text{Nb}_2\text{O}_5$, $\text{TiO}_2\cdot\text{Ta}_2\text{O}_5$, and $\text{Ta}_2\text{O}_5\cdot 2\text{TiO}_2$ (*See, e.g.*, Brock, column 2, lines 50-56).

Brock, however, does not disclose the invention recited in independent claim 1, as amended. Claim 1, as amended, recites a transparent substrate having an antireflection coating that is made of a multilayer stack comprising alternating thin layers of high and low refractive indices, wherein at least one of the high-index thin layers is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer, wherein the additional high index layer has a refractive index of at most 2.3. In contrast, Brock discloses a high-index thin layer that consists of TiO_2 and a second metal oxide (*See, e.g.*, Brock, column 2, lines 44-46). There is absolutely no disclosure in Brock of a high-index layer that is a multilayer, much less a multilayer that is a titanium oxide layer and at least one additional high index layer, wherein the additional high index layer has a refractive index of at most 2.3, as presently claimed. Accordingly, Brock does not anticipate claim 1, as amended.

Nakano discloses a functional glass having improved wear resistance (*See, e.g.*, Nakano, abstract). The glass has an optical thin film having a material with a high refractive index and a material with a low refractive index (*See, e.g.*, Nakano, abstract). The material for the film having a high refractive index can be ZrO_2 and/or TiO_2 and the material for the film having a low refractive index can be SiO_2 and/or Al_2O_3 (*See, e.g.*, Nakano, abstract).

Nakano also does not disclose the invention recited in independent claim 1, as amended. As noted above, claim 1, as amended, recites that at least one of the high-index thin layers is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer. Nakano, similar to Brock, does not disclose this feature. In contrast, Nakano discloses a high-index thin layer that consists of ZrO_2 and/or TiO_2 (*See, e.g.*, Nakano, abstract). There is absolutely no disclosure in Nakano of a high-index layer that is a multilayer, much less a multilayer that is a titanium oxide layer and at least one additional

high index layer, wherein the additional high index layer has a refractive index of at most 2.3, as presently claimed. Accordingly, Nakano does not anticipate claim 1, as amended.

Indeed, claim 1 was amended to include the features of claim 10 that the Examiner recognized was patentable if written in independent form. Accordingly claim 1, as amended should be allowable. For the above reasons, Applicants respectfully request that the rejection of claims 1-3 and 14 under 35 U.S.C. § 102(b) be reconsidered and withdrawn.

THE REJECTION UNDER 35, U.S.C. § 103 (A)

Claims 15-16, 20-23, and 25 were rejected under 35 U.S.C. § 103(a) as being obvious over Brock in view of U.S. Patent No. 5,073,451 to Idia et al. ("Idia") for the reasons set forth on pages 3-4 of the Office Action and claim 24 was rejected under 35 U.S.C. § 103(a) as being obvious over Brock in view of Idia and further in view of U.S. Patent No. 5,948,544 to Kim et al. ("Kim") for the reasons set forth on page 5 of the Office Action.

Idia discloses a heat insulating glass plate with a multilayer coating which has low transmittance for solar radiation, high transmittance for visible light and radio waves, good durability, and suitable for use as a vehicle window glass (*See, e.g.*, Idia, column 2, lines 39-44).

Kim discloses a polyester multilayer sheet and a process for preparing the sheet (*See, e.g.*, Kim, column 2, lines 40-41). The sheet has good impact strength, weatherability, and transparency (*See, e.g.*, Kim, column 2, lines 40-44).

As discussed above, Brock fails to disclose or suggest a high-index layer that is a multilayer, as presently claimed. Furthermore Brock clearly does not disclose or suggest a multilayer that is a titanium oxide layer and at least one additional high index layer, wherein the additional high index layer has a refractive index of at most 2.3, as presently claimed. This, however, is an important feature of the invention in that it allows thinner TiO₂ layers to be used (*See, e.g.*, Specification, page 8, lines 3-5). Using thinner TiO₂ layers is advantageous from an industrial standpoint since the sputter deposition rate of TiO₂ is low (*See, e.g.*, Specification, page 8, lines 5-6).

Both Idia and Kim fail to remedy the deficiency in Brock. There is absolutely no disclosure or suggestion in either Idia or Kim of high-index layer that is a multilayer, much less a multilayer that is a titanium oxide layer and at least one additional high index

layer, wherein the additional high index layer has a refractive index of at most 2.3. Indeed, as noted above, the Examiner recognized that this feature was patentable. For the above reasons, Applicants respectfully request that the rejection of claims 15-16 and 20-25 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

CONCLUSIONS

Applicants believe that all pending claims are now in condition for allowance, early notice of which would be appreciated. Should the Examiner not agree with this position, a personal or telephone interview is respectfully requested to discuss any remaining issues in an effort to expeditiously advance the application to allowance.

A Petition For Extension of Time with provision for the required fee to extend the time for responding by 1 months from June 15, 2002 to and including July 15, 2002 is enclosed herewith.

Should any additional fees be due, please charge the required fees to Pennie & Edmonds LLP Deposit Account No. 16-1150.

Respectfully submitted,

Date June 28, 2002



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Enclosure



Appendix A

Changes to the Claims

Application No.09/761,765; filed January 18, 2001

1. (Amended) A transparent substrate having at least one surface comprising, on at least one of its surfaces, an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, wherein at least one of the high index thin layers [comprises titanium oxide] has a [which is modified to reduce its refractive index [to a] value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer, wherein the additional high index layer has a refractive index of at most 2.3.

2. (Amended) The transparent substrate of claim 1, wherein the refractive index of the [at least one] high-index [thin layer] multilayer comprising at least one titanium oxide layer is between 2.25 and 2.38.

11. (Amended) The transparent substrate of claim 1 [10], wherein the at least one additional high index layer has a refractive index of between 1.9 and 2.2 and comprises tantalum oxide, zirconium oxide, tin oxide, indium oxide, zinc oxide, silicon nitride, or aluminum nitride.

12. (Amended) The transparent substrate of claim 1 [10], wherein the high-index multilayer comprises two contiguous layers and [wherein] the additional high index layer is closer to the substrate than the titanium oxide layer.

14. (Amended) The transparent substrate of claim 1, wherein the low index thin layers have a refractive index [indices] between 1.30 and 1.65 and comprise one or more of silicon oxide, aluminum oxide, aluminum oxyfluoride, aluminum fluoride, and magnesium fluoride, wherein the oxides are optionally halogenated.

20. (Amended) A glazing comprising the transparent substrate [antireflection coating] of claim 1.

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25. (Amended) The glazing of claim 21, [adapted] for use as the internal or external glazing for buildings, to protect paintings, a motor-vehicle window, a mirror, a display screen, a decorative glass, a shop window, a shop-counter, or a refrigerated display-cabinet.

Appendix B

Currently Pending Claims

Application No.09/761,765; filed January 18, 2001

1. (Amended) A transparent substrate having at least one surface comprising, on at least one of its surfaces, an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, wherein at least one of the high-index thin layers has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer and at least one additional high index layer, wherein the additional high index layer has a refractive index of at most 2.3.

2. (Amended) The transparent substrate of claim 1, wherein the refractive index of the high-index multilayer comprising at least one titanium oxide layer is between 2.25 and 2.38.

3. The transparent substrate of claim 1, wherein the thin layers comprise a dielectric material, a low emissivity material, or a solar-protection coating.

11. (Amended) The transparent substrate of claim 1, wherein the at least one additional high index layer has a refractive index of between 1.9 and 2.2 and comprises tantalum oxide, zirconium oxide, tin oxide, indium oxide, zinc oxide, silicon nitride, or aluminum nitride.

12. (Amended) The transparent substrate of claim 1, wherein the high-index multilayer comprises two contiguous layers and the additional high index layer is closer to the substrate than the titanium oxide layer.

13. The transparent substrate of claim 12, wherein the absolute value of the difference between the refractive index of the additional high index layer less the refractive index of the titanium oxide layer is between 0.1 and 0.6.

14. (Amended) The transparent substrate of claim 1, wherein the low index thin layers have a refractive index between 1.30 and 1.65 and comprise one or more of silicon oxide, aluminum oxide, aluminum oxyfluoride, aluminum fluoride, and magnesium fluoride, wherein the oxides are optionally halogenated.

15. The transparent substrate of claim 14, wherein the thin layer of the antireflection coating most removed from the substrate is a low index layer comprising a $\text{SiO}_2\text{-Al}_2\text{O}_3$, wherein the atomic percent of aluminum with respect to silicon is from 5 to 20 percent.

16. The transparent substrate of claim 14, wherein the multilayer stack comprising alternating thin layers of high and low refractive indices antireflection coating has a formula (high-index layer/low-index layer)_n, wherein n is 2 or 3.

20. (Amended) A glazing comprising the transparent substrate of claim 1.

21. The glazing of claim 20, further comprising a layer or multilayer stack that is a solar protection layer, a heat absorbing layer, a UV protecting layer, an antistatic layer, a low emissivity layer, a heated layer, an anti-fouling layer, a hydrophobic organic layer having an anti-rain function, a hydrophilic organic layer having an anti-fogging function, or a silvering layer.

22. The glazing of claim 21, wherein the glazing comprises extra-clear glass or solid-tinted glass and wherein the glazing is optionally, toughened, reinforced, curved, or bent.

23. The glazing of claim 21, wherein the glazing comprises a transparent polymer material.

24. The glazing of claim 22, wherein the transparent polymer material comprises a polycarbonate or a polyacrylate.

25. (Amended) The glazing of claim 21, for use as the internal or external glazing for buildings, to protect paintings, a motor-vehicle window, a mirror, a display screen, a decorative glass, a shop window, a shop-counter, or a refrigerated display-cabinet.